





**TOUR NOTE**  
**AND**  
**IMPRESSIONS ON A SHORT TOUR**  
**IN THE**  
**BOMBAY DECCAN**

**BY**

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# TOUR NOTE AND IMPRESSIONS ON A SHORT TOUR IN THE BOMBAY DECCAN.

## Itinerary—

|        |      |    |    |    |                       |
|--------|------|----|----|----|-----------------------|
| August | 20th | .. | .. | .. | Arrived Poona.        |
|        | 21st | .. | .. | .. | To Khod and back.     |
|        | 22nd | .. | .. | .. | To Kolhapur.          |
|        | 23rd | .. | .. | .. | To Bijapur.           |
|        | 24th | .. | .. | .. | To Hippurgi and back. |
|        | 25th | .. | .. | .. | To Igli and back.     |
|        | 26th | .. | .. | .. | Halt.                 |
|        | 27th | .. | .. | .. | To Sholapur.          |
|        | 28th | .. | .. | .. | To Poona.             |
|        | 29th | .. | .. | .. | Halt.                 |
|        | 30th | .. | .. | .. | Left Poona.           |

I am very grateful to the Bombay Government for inviting me to visit the Soil Conservation and Land Development work at Bijapur. I had written, asking that I might come, as I particularly wished to study the organisational side of this successful work as I knew that in other provinces many such problems were exercising the minds of those engaged in planning the foundations of post-war development. Although the final shape of things has not yet been definitely decided as regards the Land Improvement Section's work (popularly known as the Bijapur scheme) the general plan of the administrative and executive frame-work can be said to be more or less settled, and I was able to come away with impressions which I hope will be of value to others.

During the tour I had the benefit of frequent discussions with Mr. W. C. de C. Walsh, Chief Conservator of Forests, Bombay, Mr. J. Petty, O.B.E., M.C., Special Conservator, Planning, and most of the Conservators; at Bijapur the party was joined by Mr. J. M. Sweet, a Conservator from Madras. At Poona I met Mr. D. B. Sothers, C.I.E., the Land Improvement Officer (General), now officiating as Director of Agriculture and was granted interviews by His Excellency Sir Charles Bristow, C.I.E., I.C.S., Acting Governor of Bombay, and Sir Godfrey Collins, C.S.I., C.I.E., O.B.E., Adviser to His Excellency.

The tour included a visit to Kolhapur at the invitation of the Resident, Deccan States, Lt.-Col. C. W. L. Harvey, O.B.E., M.C., where the question of arranging for a Forest Adviser for the States was discussed.

Although I had gone to Bombay specially for the purpose of studying the Bijapur Land Improvement Scheme, I also took the opportunity of discussing post-war forest plans, and this note is therefore divided into two sections, section I dealing with forest plans, and section II with the activities of the Land Improvement Section.

## SECTION I.—POST-WAR FOREST PLANS.

*Importance of deciding on a definite policy.*—I think what impressed me most was the realistic way in which planning is being undertaken; the importance of declaring, as far as possible, a definite policy or policies for land improvement, grazing schemes, private forests, minor forests etc. before attempting to take up any detailed work cannot be over-emphasised. I am sure that one of the chief reasons why the voluntary closure movement (with the hint of compulsion behind it) has proved so successful in the Punjab is that a practical policy has been followed from the beginning without the necessity for making any important changes. Villagers soon get accustomed to restrictions and prohibitions which are not subject to frequent change; I feel sure this has also been a factor in the success of the bunding schemes. Another point is that until policy has been laid down it may be difficult to foresee the lines along which expansion and organisation of the department will develop. In some provinces

plans cannot be made until some Government organisation, such as a Land Utilisation Board, has got to work, but in Bombay I think the Land Improvement Schemes Act could be used for defining how land can be utilised to the best advantage.

*Appointment of a special Conservator to co-ordinate planning.*—It is not considered possible for the Chief Conservator himself to co-ordinate the planning stage of the very wide range of subjects which are covered by the post-war plans, and the Bombay Government have created a special temporary post of Conservator, Planning. In general his functions are first to suggest policy and then to work out the details of application for the general post-war reconstruction plans which have already been submitted to Government. This officer has to deal with grazing schemes, private forests control, soil conservation, utilisation, resources surveys and a number of other subjects; he has to consult numerous officers both of his own and other departments and of the Government. So great is the field to be covered and so many the problems to be solved, that there is no doubt that such a post is essential in all the major provinces if plans are to be put into effect in a reasonable time and if waste of staff and money on ill-conceived effort is to be avoided. All reports and proposals put up by him are dealt with by the Chief Conservator of Forests before submission to Government. The general principle which it is proposed to follow is to get policy decided first and then to work out the detailed possibility of the plans; this, as I have already stated, is the correct way of approach. The Conservator, Planning, proposes to make several tours to other Provinces to study their plans and methods. This is very sound practice and I strongly recommend it to other Provinces.

*Utilisation Plans.*—I was very impressed by the plans under investigation for the maximum development of the resources of the forests. The plans aim largely at tapping new sources by utilising the less valuable species and jungle-woods; these so-called inferior species occupy the major proportion of the space in India's forests and it is probably no exaggeration to say that the future of Indian forestry demands mainly on the development of those industries, such as plywood, which can utilise inferior species.

Then there are plans to increase the output of charcoal; Bombay is a great charcoal-burning country, and the capital alone consumes 300,000 tons a year, a good proportion of which ordinarily comes from the Central Provinces.

Special features of development planning are :—

*Bamboo pulp.* It is hoped to arrange an aerial survey of the bamboo producing tracts with a view to establish a pulping plant for paper and rayon.

*Wood distillation.*—Negotiations are proceeding for the establishment and working of a wood-distillation plant by a firm working on a profit-sharing basis with Government; the chief product will be charcoal, with tar and, possibly, wood alcohol as a by-product.

*Paper pulp from forest grasses.*—This is another possibility which is to be explored.

*Pre-fabricated wooden bridges.*—This is a proposal in which it is hoped the Public Works Department will interest themselves; information on this subject is expected from America.

*Saw-mill policy.*—The use of small portable mills in felling areas is contemplated; in this way it would be possible to saw to standard sizes in the forest. The possibility of using portable treating tanks is also being investigated.

*Timber seasoning.*—It is proposed to experiment in and develop timber seasoning with a view, it is hoped, to supply wooden standards for the electric grid.

*Silvicultural research.*—One of the post-war schemes is the establishment of a proper provincial silvicultural research organisation. There are certainly numerous subjects for research, and it is extraordinary that a province of this size has not had one before. One result has been that the Land Improvement Section, has, up to the present, had to obtain much of its tree seeds from Madras.

*Resources and Industrial survey.*—I understand that it is proposed to make a forest resources survey with special regard to the great block of some 2,500 square miles of forest in Kanara, the yield possibilities of which are largely an unknown quantity. The Conservator, Planning, has also issued a questionnaire to all factories in the Province concerned with the utilisation of forest produce in order to assess the demands of industry; he is being assisted in his efforts by the Director of Industries.

This matter was discussed at the Senior Forest Officers Conference in April of this year, when a number of officers considered it unnecessary; it may not be necessary in all provinces, but personally I do not know how planned development can take place without a knowledge of the country's resources; certainly it is unfair to encourage industries which use timber or timber products unless it is possible at the same time to provide them with a reasonable estimate of the quantities of raw materials and particulars as to their situation. I do not know what such a survey would cost, it may not be much and may be partly aerial, but it is probable that future profits will come mainly from the utilisation of the less well-known woods.

I was not told anything about plans to develop minor forest products, but presumably this important field will not be over-looked.

*Assistance of the Forest Research Institute.* It is obvious that the Forest Research Institute will have to play its part in assisting the lines of development referred to above; very close collaboration is essential. The Institute must be apprised of all the plans contemplated by Provinces and States; the scope of the plans now under consideration in Bombay show how very necessary are the schemes for reorganising the Institute and bringing it up-to-date.

*A Private Forests Bill.*—The Chief Conservator of Forests considers it unnecessary in the case of his Province, to enact a separate Bill; he considers that Chapter V of the Indian Forest Act can be suitably amended. I have discussed his draft provisions with him and I am inclined to agree but naturally the Legal and Revenue Departments will be consulted. The Provinces are empowered to frame their own Forest Act *in toto* or amend it as they wish, provided such amendments are not repugnant to any provisions of the Government of India Act of 1935.

*Propaganda.*—At the Senior Forest Officers Conference held in April, it was recommended that provinces should set a small forest propaganda organisation with the objects of interesting the public generally in forest matters and in particular to obtain the co-operation of the rural population in schemes of land and forest rehabilitation. I understand that this proposal is being considered by the Forest Department.

*Minor Forests, Village Forests and Firewood.*—Almost everywhere I have heard uncertainty expressed as to how Sir Herbert Howard in his note on Post-war Forest Policy intended that the problem of providing the village consumers with firewood and small timber should be solved. References in this note are made to Minor Forests but it has been left to Provinces and States to work out their own policy and its application. Some forest officers in Bombay were under the impression that the Punjab had solved the problem with their system of village forests managed by co-operative societies. I do not think the Punjab have ever made this claim; but the matter is

such an important one and there is ~~no~~ much uncertainty as to what policy to adopt or how to set about creating village forests that I feel that I must try and clear the air.

Minor forests may be owned by individuals, by village communities or by Government; they may be managed by the owners themselves, or by societies and panchayats or by Government, or Government may manage them on behalf of the owner(s) under some agreement. Thus, village or community-owned forests are minor forests (there may be rare exceptions) but minor forests are not necessarily village forests. It is most unlikely that any one type of minor forest by itself would be capable of solving the problem of supplying firewood and small timber for cultivators and local purchasers in any particular rural area; advantage must be taken of the possibilities offered by local land, economic and social conditions. The main problem is to make firewood available for millions of small cultivators who cannot afford to pay for it; it will be of value to compare the capabilities of the different types of minor forest to achieve this object.

*Can forests grown on the village waste and managed by village societies fill the bill?* Only to a small extent, I think. The Punjab societies were formed mainly with the objects of organising the village community to protect the common land against erosion, of developing waste land and of increasing prosperity generally. In all cases it has been one of the primary objects of the society to obtain the highest income from the land; thus, although bye-laws have permitted the casual removal of dead trees for fire-wood, etc., the bulk of the produce is sold to contractors who probably export most of it.

The same is the case with privately owned minor forests; the owner keeps what he requires for himself and sells the rest to the best advantage; the money-making urge is too strong.

The ideal which, perhaps some Utopians look for is the village forest managed by a society or committee, which daily distributes firewood to the village community, to each according to his needs; the time is, I am afraid, far distant when this can be considered practical politics.

A Private Forests Bill may give powers to compel the afforestation and management of waste land by the owner with or without the assistance of Government. Then there is the alternative where Government might acquire, either permanently or temporarily on lease, privately owned land, such as waste, water-logged or saline land, or any land beyond the capacity of the owner to develop for the purpose of raising minor forests. It might be possible so to locate these forests as to make each of them serve a number of villages conveniently and sufficiently closely grouped round them. It would be a matter of policy whether Government would insist on these forests being made to pay for themselves or whether the produce should be sold at nominal rates which would involve a loss in their management. In the former case it would be practicable to establish this type of minor forest only in localities where the cultivators are sufficiently prosperous to pay a fair rate for their fuel. But a broad view must be taken; large tracts of country are under-developed and can only be developed through Government agency. The afforestation of waste land may help to give effect to other objects of long-term Government policy, e.g., the increase of the percentage of land under forest on general climatic and economic grounds, to reduce water-logging or prevent erosion, to mitigate the effect of hot, dry winds and to reclaim and improve intractable land generally; in such cases, firewood production would be a secondary object and a policy of free grants would be justified.

my feelings, however, are that the mass of poor cultivators must have their firewood free, must be able to get it as they want it, i.e., during the day's work, and it must be within easy reach; they will never use it unless it comes to them free and easy as it does in the case of cow-dung. Where large forest grazing grounds exist, those who tend the cattle usually return in the evening with a head load of dry firewood and no serious problem arises here: but far and wide I think the ultimate solution lies in the cultivator growing his own firewood on the borders of his fields, on the little patches of waste ground round wells and habitations, along the banks of streams and torrents, etc. Here and there this is already done, it requires encouraging, directing and assisting by the free supply of plants and seed. And I would go so far as to say that in barren tracts like the Deccan, and the Thal of the western Punjab, where trees are also required as wind-breaks, these measures must be accompanied by the compulsory exclusion of goats, as is, in fact, being done in the Deccan.

But I do not believe that minor forests in themselves are sufficient; they must be integrated in a wide policy of firewood and charcoal production which may even include provision for export. Large towns, small towns, industries, and countless consumers in the country, other than the cultivators, require firewood or charcoal and are able to pay for it; there is therefore plenty of room for the firewood sold by the Village Forest Society or the private owner and they should not be discouraged merely because they do not cater for the small cultivator. For the cultivator will be tempted by high prices to sell to the purchasing consumer instead of using his firewood himself, unless the latter can obtain it cheaply elsewhere; this happened during the war in many parts of India and has resulted in a serious depletion of tree growth in the countryside. Thus it is clear that the success of any scheme designed to encourage the use of firewood instead of cow-dung may depend to a greater or less extent on the adequacy of an administration's plans to provide cheap fuel for all classes of consumers, and this is particularly important in localities where communications are good.

Minor forests, therefore, may be anything from Government owned and managed forests down to a small patch of trees growing round a cultivator's well or a row of trees on a contour bund or minor irrigation channels; they would also include roadside and canal avenues. Local conditions, which may vary even within one district, must decide the best means of tackling the problem. Obviously one important factor is the availability of suitable land and it may well be that in some provinces before a satisfactory firewood plan can be drawn up, as indeed they must, a utilisation survey of waste and uncultivable land will have to be made.

These notes are of a general nature. I did not have sufficient time to study conditions in Bombay in detail, but it is obvious that considerable increases in firewood production are possible from the development of revenue waste, "inamdars" and other private forest and by the introduction of rotational closures in Government forest; for the rest, and particularly in the Deccan uplands, the best course may be to foster the growing of trees on bunds, etc., and along the banks of water courses and torrent beds. One feature that struck me was the almost entire absence of village common land and this narrows down the number of minor forest types which could be contemplated.

All these matters are under the active consideration of the Forest Department and these notes may, it is hoped, help towards the crystallising out of a policy.

*Grazing Problems.*—Forest grazing has, I was told, been practically ruined as a result of the abolition of grazing fees. The Chief Conservator has proposals in hand to re-introduce the payment of fees and to establish a system of controlled rotational



grazing, the chief features of which will be the fixation of a definite grazing incidence for essential animals which include plough bullocks (the number per household being based on the acreage of the holding), plus two cows and two calves. Full details are not yet worked out, and one difficulty likely to arise is that there will not be sufficient area for the non-essential animals; they will have to be stall-fed or sold.

I saw a number of *inamdar* forests under erosion from excessive grazing and other forms of abuse; presumably they will be tackled through the Private Forests Bill and the grazing improved through proper management. One of the first requirements in India is economic grazing, that is the provision of good grazing for good, profitable animals which can earn their grazing; everywhere at present grazing is unprofitable in several senses. The popular cry for more extensive and free grazing must be resisted; for this merely means the retention of more unthrifty beasts which prevents any chance of upgrading and improvement, most proposals for which are of little value as long as uneconomic grazing is prevalent.

*Organisation of the Forest Department for Post-war Development.*—Post war forest plans include the creation of minor forests, control or supervision of private forests, fodder and grazing improvement schemes, counter-erosion schemes, the management of canal bank plantations etc. These are largely social-service schemes; they are not directly productive of income. In the past it has been customary to judge the activities of Forest Departments by their annual profit and loss account; this can still be done as far as the management of the Government reserves are concerned; but the finances of the "social service" side of the Departments will have to be kept separate.

All this development necessitates considerable expansion of the Forest Department, which in turn may mean some degree of re-organisation. In one province in order to deal with these development plans, the Chief Conservator has proposed the building up of a new department in a period of five years. Since this department is to be staffed entirely by forest officers and is to carry out duties which are, in the main, those of forest officers, the proposal amounts to having two Forest Departments in one Province, an arrangement which is open to criticism. In another province where considerable expansion is contemplated, it is probable that the ultimate organisation of the Forest Department will consist of two Chief Conservator's charges, one of which will be concerned with "social service" and land development plans and the other with Government forests. Expansion somewhat on these lines may be required in Bombay, but the structure of organisation can take two quite separate forms. In the first, there can either be a separate development branch of the Department, under a Chief Conservator, which will deal entirely with the "social service" side; in this case the executive charges of this branch might often overlap, territorially, existing forest executive charges in the other Chief Conservator's administration. In the second case, there will be no separate development branch but the number of forest circles and divisions will be increased and the executive charges will include in their activities not only normal forest work but also whatever "social service" work falls within their boundaries. This arrangement avoids overlapping and has been suggested in one province where the Divisional Forest Officer will be responsible for every form of forest activity, including even roadside avenues, in his charge.

However, overlapping may not be a serious difficulty in Bombay, where the forests often form huge blocks by themselves, and it might be more convenient to constitute a separate development branch.

*Co-operation between Agriculture and Forestry.*—A very welcome feature is the close co-operation which exists between the Departments of Agriculture and Forestry. This is obviously the chief factor making for progress in land development plans

in the Province: Regular meetings between representatives of the two departments take place and the Chief Conservator informed me that the first item on the agenda for the next discussion was the common policy for future land development plans. Such plans would probably include co-operation between the two departments both in the Deccan bunding scheme and in schemes in other tracts involving large catchment areas under the control of the Forest Department.

The success of future land development plans, particularly in the field of soil and water conservation, depends on close collaboration between these two departments; and those provinces will be at a distinct disadvantage in which Agriculture and Forestry are in different ministerial portfolios or under different Advisers. I understand that in Bombay both departments are under one and the same Adviser.

## SECTION II—THE BUNDING AND DRY FARMING SCHEME.

*Origin and purpose of the scheme.*—The impulse to start this scheme, popularly known as the "Bijapur" scheme, was given by the fear of famine which constantly hangs over the whole of the Deccan and which costs so much in expenditure on relief. All conditions favourable for famine are present; almost the whole tract is subject to drainage to a greater or less extent, the annual rainfall is low, about 20", and cloud bursts may be succeeded by long rainless breaks, the soils are shallow, and drying winds sweep the desolate and treeless uplands. But the more favourable conditions apparent in the depressions and valleys where a deeper soil has collected, showed that if the soil could be held *in situ* and gradually built up on the slopes and if rainfall could be contained in the fields instead of being allowed to run to waste, the fertility of the greater part of the tract could be raised and would continue to increase with improved dry farming methods. The enormity of the task, involving some 20 million acres, might have made the greatest optimist despair; but the authors of the plan, confident in the correctness of their methods, have tackled the problem with boldness and with disregard of opposition and have, so far, met with the success they deserved.

*The Bombay Land Improvement Schemes Act.*—In brief, the Bombay Government considered that conditions were sufficiently serious to merit the widespread use of the Land Improvement Schemes Act. (A note describing how the Act is operated is given in Appendix E). The wisdom of this policy lay in the recognition of the fact that the measures had to be pushed forward smoothly and systematically; these conditions are essential in soil conservation where operations must be completed with reference to particular catchments and drainages and must ride rough-shod over old established field boundaries; steps have to be taken to ensure that no one can place obstacles in the way of those responsible for the execution of the plan. I do not know what opposition there was to compulsion in the early stages, but I am sure there is little now. This all goes to strengthen my two convictions; first that where large scale soil conservation measures are planned for areas where the peasantry is uneducated and lacking in the spirit of self-help Government must possess residual powers to enforce co-operation; and second, that as soon as the same peasantry realises the benefits of the measures, any hostility they may have harboured disappears and they come to look on compulsion as part of their life work.

There are a few special points about the use of the Act which I would like to point out here:—

- (i) Once a scheme has been notified it remains in force for an indefinite period as it includes provisions for maintenance, protection of trees, etc., laying responsibility on the owner of the land,

(ii) the Board has the power to make any further regulations considered necessary at any time with respect to a notified scheme without reference to the owners of the land,

(iii) the Land Improvement Officer is vested with full powers over any land in the execution of a scheme, which may even include land under the control of another Department,

(iv) the browsing and herding of goats is prohibited by means of the Cattle Trespass Act in areas notified under a scheme,

(v) no compensation is payable to any person on account of any restriction or prohibition imposed under the scheme,

(vi) in actual practice the delay involved in the enquiry procedure prescribed by the Act is avoided by obtaining in advance the written consent of the village body, when the Land Improvement Officer proceeds to the execution of the scheme in anticipation of the results of the formal proceedings.

(vii) the sanctioned cost for bunding and preliminary dry farming operations is Rs. 15/- per acre. Of this Rs. 9/- are recoverable from the owner of the land; recovery is effected by the Revenue Department at the rate of 12 annas per acre per annum, beginning from the third year after completion of the work. Full details, including a map showing the exact position of the bunds in all fields are supplied by the Land Improvement Officer to the local revenue authority; these become a permanent land record.

*Scale of operations.*—Field operations began in 1943, and in each of the first two years the area covered in bunding operations was so near 1,20,000 acres; in the present year it is expected that 2½ to 3 lakhs of acres will be dealt with. As the total "famine" area is about 20 million acres, it is for serious consideration whether expansion of the existing organisation is not essential; and it must be remembered that there are very extensive areas in other parts of the Province which can be benefited by conservation measures.

*Dry Farming.*—Soil conservation measures are not considered an end in themselves; they are a means, and an important one, to an end which is the increase in soil fertility; the other means to the same end is research and improvement in Dry Farming methods. I am no expert in this science and will merely state that a strong Dry Farming section is being built up and works along with the bunding staff; but as the bunding staff moves on, the dry farming experts stay behind and, as far as I am aware, are to become a permanent advisory organisation in each district. I understand that this staff will be organised as follows:—

1 Dry Farming Overseer per 5,000 acres (or, 2,000 acres in the case of dispersed plots).

1 Dry Farming Field Assistant for every 5 Overseers or 25,000 acres.

1 Senior Land Assistant, Dry Farming, for every two Field Assistants, or 50,000 acres.

The Senior Land Assistants will be responsible to the Dry Farming Officer.

*Training of Subordinates.*—At Bijapur a school has been established for the training of the subordinate survey and bunding staff. Forestry is taught, also publicity and educational technique. The erosion models, constructed by members of the school, are the best I have seen any where. Training is given a strong, practical bias, as it should be. The elements of dry farming technique are expalined so that the men turned out know something about all sides of the work,

At Sholapur a Dry Farming School has been started recently. Since the subordinates trained here may have to undertake the protection of trees on the bunds, etc., some training in forestry seems essential, though it need not be much. It is a sound principle that in combined land operations everyone should know something about the other man's work, this helps to widen interest and to kill the deadly spirit of departmentalism.

Appendix F gives the syllabus of training and the prospectus of the Dry Farming School.

*Research.*—A Dry Farming Research Station has also been opened at Sholapur.

*The Field Bunding Technique.*—Mr. V. A. N. Sausman of the Bombay Forest Service can justly claim to be the author of the contour bunding system in Bombay. He discarded the system of large bunds with masonry waste weirs erected across drainage channels, which had been adopted by Bombay Agricultural Engineers, and he realised that the common Punjab practice of "table top" terracing which he had previously seen, was unsuitable for Deccan conditions. Terracing (levelling of fields) would have been far too expensive and Deccan soils are generally far too shallow. Although, in the first year, bunds were erected on a rectangular pattern, this system was abandoned in subsequent years in favour of an alignment which meticulously followed the contour. I was amazed when I first saw what I can only describe as the fantastic sinosities of the bunds which faithfully picked out almost imperceptible changes in the profile of the slope. This technique has been adopted because it follows a fundamental principle of soil conservation in cultivation that rainfall held on the land must be distributed as evenly as possible over the land both to reduce the destructive effect of run-off and to secure maximum irrigation value for the crops. By following the contour exactly these objects are fully realised (only table-top terracing such as is practised in hill rice cultivation alone provides closer control.) It is claimed that the bunding lay-out does, in fact, irrigate each field completely inasmuch as the downward percolation of water collected above one bund meets the water contained by the bund next below. This may or may not be the case, but it can at least be said that the system provides the most equitable distribution of water possible under local conditions.

Very serious rain-storms are frequent; in one case after a measured rainfall intensity of over 5" an hour, the breaching of the bunds was only 1.5 per cent.

Every attempt is made to save as much water as possible and bunds are even extended across roadside drainages in order to bring water on to the fields. No waste weirs are used in the bunds, but small check-dams are constructed in natural drainage-channels to prevent erosion. I do not propose to discuss the details of survey and bund lay-out, I will only say that I am not entirely convinced that the narrow curves and loops in the bunds are really necessary; for the small, imperceptible depressions to which they conform will soon fill up as a result of ploughing and the gradual movements of surface soil by rainfall. But the argument put forward by the local officers, that if the surveyors are given any freedom of action, it will not be possible to control their work, is a sound one and it would perhaps be better to make no change until more experience has been gained and surveyors are more skilful.

The final test of success will be the standard of maintenance. The bunds must become as permanent as the land itself. The ironing out of sharp curves by the cultivators may be expected; but this will not matter if weak spots are not left.

*Application of the scheme elsewhere.*—It should not be thought that the bunding technique described above is applicable in all sets of conditions, though I know that there are many localities in other parts of India where it can be used with advantage. The large bunds with waste-weirs, found unsuitable here, are correctly used for the impounding of storm water for local irrigation or for the trapping of silt for *rabi* cultivation, a common practice in parts of the Punjab and Rajputana and probably elsewhere. Again, where steeper slopes and more impervious soils than are found in the Deccan prevail, a closer control of run-off is necessary and this means adopting the small field type of terraces.

*Treatment of Waste Land.*—The Land Improvement Officer is empowered to decide what land is fit for cultivation and what is unfit. Uncultivable land is contour-trenched and sown up with the seeds of various tree species. These measures serve several objects:—

(i) the waste is situated mainly above cultivation; the trenches serve to reduce run-off which would endanger the bunds below;

(ii) the rows of trees, when they grow up, may help to mitigate the desiccating effect of the wind;

(iii) leaf fall will provide some humus which is so badly required in the cultivation fields.

Although it is hoped that the trees will in time produce firewood, my own opinion is that the rocky soil and winds will permit too poor a growth for this purpose; moreover the spacing between trenches is very wide and the crop produce will be open; this cannot be avoided since the owners of the land have to pay Rs. 9 for this work, as in the case of bunding and closer trenching would be too costly.

Should any area of Government waste fall within the scope of a scheme it is likewise trenched and sown up. These areas will, I understand, subsequently be taken over by the Forest Department, when they will, no doubt, be further developed, and managed as minor forests for fuel production and pasturage.

*Use of bunds for growing trees.*—This country urgently requires tree growth both for fuel and for wind breaks. I have said that I do not think the rocky outcrops will be able to supply much firewood; the Land Improvement Officers have already started to encourage the growing of trees on the bunds, and I feel sure that this is the real answer; in addition, the growing of trees round habitations on small pieces of unused land should be encouraged. I think quite good growth can be expected on bunds in the low-lying lands, and the banks of all torrent-belts and water courses should be afforested. Although most cultivators will say that trees on the borders of fields reduce crop yield in their proximity, it is surprising what a number of trees are to be seen growing on the edges of fields in some parts of the country and I think that the old prejudice will die out in time. The Agricultural Department has agreed to experiment with the growing of wind breaks; it may well be that the small loss occasioned to the crops by the proximity of the trees will be offset by a general improvement due to a reduction of desiccation, while the use of firewood as fuel will free cow-dung for its rightful purpose as manure. Some species of trees are probably less harmful to crop growth than others and this will be an interesting subject for combined research by the two Departments.

There are bound to be difficulties, but I would advise against the use of the powers of the Land Improvement Scheme to compel the planting up of field bunds. Persuasion will probably succeed in the end and the greatest enemy of "farm

forestry", the goat, is being eliminated by means of the Cattle Trespass Act ; it will be a primary duty of those in charge of maintenance to see that they do not creep back again.

*Lessons to be learnt from the Bombay Bunding and Dry Farming Scheme.* There are many lessons to be learnt from a study of this project and one of the best ways is to examine the factors which have contributed to its success. The more important ones appear to me to be :—

(i) the organisation has been built up from officers drawn from several departments, e.g. agriculture, forests, revenue and engineers ;

(ii) the right men were chosen for the lead irrespective of service or seniority ;

(iii) this composite organisation was able to tackle definite scheme in an *ad hoc* way with a dispatch which would never have been possible had the usual departmental machinery been employed ;

(iv) a sound policy was conceived from the beginning and the details of a sound and practicable technique established at an early stage ;

(v) at the back of it all was an authority in the form of the Land Improvement Act which the executors of the scheme knew could be used at any time to secure the ordered progress of their plans. It is true that everywhere now the willing co-operation of the cultivators is forthcoming as a result of remarkably fine propaganda work, but the fact that the law is behind it all probably exerts some subconscious influence.

There are four other less important factors, but they are worth mentioning because they connote conditions which may be unfavourable in other parts of the country where land improvement schemes are contemplated :—

(vi) the Deccan is largely a famine area and the people poor ;

(vii) the people are mainly owner-cultivators, and tenancy problems do not arise ;

(viii) conditions of soil, topography, erosion, climate are remarkably homogeneous over a very wide area, making it possible to apply universally a scheme which does not require frequent local variation, particularly in the matter of costs. This would not be possible where variations in slope, nature of soil and type of erosion were marked ;

(ix) the work is cheap and only to a very small extent does it involve the breaking down of any old established soil-conservation practice.

My opinion is that the first two factors are the most important, and the third is really a corollary of these two. But I would say this, I think that any loosely-woven organisation composed of ill assorted officers of different departments would be worse than useless ; such a composite organisation must consist of selected men under a vigorous and competent directive.

I am convinced that large-scale land development plan must be carried out broadly in accordance with the policy expressed in the first five factors of success. There may be argument as to the degree of compulsion necessary and in this respect the local administration must be guided by a number of conditions, the most important of which will be expediency ; and it must be remembered that in land improvement operations, particularly in the field of erosion and water control, operations will be much more expensive and take much longer if plans are frustrated or delayed as a result of non-co-operation on the part of the few ; the principle of the greatest good of the greatest number must prevail.

To return to the question of organisation, the directive authority of the scheme is the Director of Agriculture; the organisation is known as the Land Improvement Unit; under him is the Land Improvement Officer (General) who is in charge of the Unit; under him are two Land Improvement Officers each controlling operations over four districts—full details of the organisation are given in Appendix A and grades and pays in Appendix B. Clerical establishment, with pay, is given in Appendices C and D.

The most striking feature of the organisation is its composite nature, but it is worth pointing out that although the work mostly concerns agricultural land the senior executive officers have been drawn from the Forest Department. The reason for this lies in the nature of the training of forest officers. They are trained to deal objectively with plans and projects; the nature of their work is such that they naturally size up land problems *in extenso*. Thus, it is that both in the Punjab and in Bombay the Forest Department has been at the forefront in land improvement schemes, other than those connected with irrigation. But whereas in Bombay the organisation described above appears to be just what is required, that in the Punjab, where the Forest Department alone is attempting to deal with soil conservation in agricultural land, is not proving so successful. I have only mentioned these matters to give point to what I have described as the two most important factors for success. Admittedly conditions in the Punjab are very different and the difficulties are probably greater, but that is all the more reason for getting the right organisation.

*A Land Improvement Department.*—The Land Improvement Section is a going concern, but what of the future? Out of the Province's 49 million acres of cultivation, 20 million lie in the famine danger zone, and another 15 million more are in the zone of moderate rainfall and can be made more fertile through improvement measures; several decades of work lie ahead; is the Section to be retained in its present form as part of the Agricultural Department, is its establishment to remain temporary, and after the passing of the survey and bunding parties, what organisation will be entrusted with the maintenance of the bunds and the care of the trees and plantations? These are problems which are now under consideration. The Section has now its own training schools for subordinates, one for the Surveying and Bunding staff and another for the Dry Farming staff; presumably the size of the Unit will be increased and it is scarcely conceivable that such a large organisation could remain on a temporary basis for so long; apart from the injustice of keeping subordinates in a temporary status, the temporary deputation of a number of gazetted officers from one department to another causes administrative difficulties. These are arguments in favour of creating a separate Land Improvement Department, and on the whole I think it would be sound policy.

Should a separate department be formed the subordinate officers would be recruited and trained by the Department direct, but for some time it would be necessary to draw on other departments for the higher appointments but the transfer would be on a permanent basis. The new department would, as soon as possible, obtain its own gazetted officers from the Agricultural and Forest Colleges direct. The head of such a Department need not necessarily in my opinion be an officer of either the Agricultural or Forest Department; he might well be a Revenue Officer of experience and wide outlook. But if a new department is created it will still be important for it to be closely associated with the Departments of Agriculture, Forestry and Revenue.

The policy for the organisation of maintenance of the bunds, tree growth and improvement of agricultural technique after the Land Improvement Section has done its work and passed on is now under consideration. There appears to be a strong bias

in favour of entrusting maintenance etc. to the local department staffs. The Revenue Department will in any case be responsible for the collection of the bunding cess, and the Dry Farming establishment which is being left behind to study and teach improved methods of agriculture might just as well be under the Agricultural Department, for further development will be a purely agricultural affair. The preservation of trees planted on the bunds and waste land will be the most difficult problem and a tendency for their neglect is inevitable unless interest and supervision are maintained. I suggest that some training in forestry be given at the Dry Farming School; and for each District or group of districts there might be a Forest Adviser, probably a Forest Ranger, whose chief duty would be the fostering of interest in "farm forestry". The Collector of the district would presumably be responsible for the observance of the regulations imposed under the schemes, such as bund maintenance, eviction of goats, protection of tree growth.



APPENDIX 'A'.  
Land Improvement, Officer, General.

| Land Improvement Officer, South.<br>(4 Districts) |                                    |                                    |                                    | Land Improvement Officer, North.<br>(4 Districts) |                                    |                                    |                                    |
|---|------------------------------------|------------------------------------|------------------------------------|---|------------------------------------|------------------------------------|------------------------------------|
| Survey  | Dry Farming                        | Forest                             | Records                            | Accounts Officer                                  | Survey                             | Dry Farming                        | Forest                             |
| (Asstt. Land Improvement Officer).                | (Asstt. Land Improvement Officer). | (Asstt. Land Improvement Officer). | (Asstt. Land Improvement Officer). |   | (Asstt. Land Improvement Officer). | (Asstt. Land Improvement Officer). | (Asstt. Land Improvement Officer). |
| 2 posts.  | 1 post.                            | 1 post.                            | 1 post.                            | 1 post.   | 1 post.                            | 1 post.                            | 1 post.                            |
| District Land Improvement Officers.               | District Land Improvement Officers |                                    |                                    |   | District Land Improvement Officers |                                    |                                    |
| (6 posts.)  | (4 posts.)                         |                                    |                                    |   | (6 posts.)                         | (4 posts.)                         |                                    |
| Senior Land Assistants (12 posts).                | Senior Land Assistants (9 posts).  | Senior Land Assistants (2 posts).  |                                    |   | Senior Land Assistants (7 posts).  | Senior Land Assistants (6 posts).  | Senior Land Assistants (1 post).   |
| Junior Land Assistants (22 posts).                |                                    |                                    | Junior Land Assistant. (9 posts).  |   | Junior Land Assistants (10 posts). |                                    | Junior Land Assistants (4 posts).  |
| Field Assistants                                  | Field Asstts.                      | Field Asstts.                      |                                    |   | Field Asstts.                      | Field Asstts.                      |                                    |
| (64 posts).                                       | (20 posts).                        | (1 posts).                         |                                    |   | (44 posts).                        | (18 posts).                        | (3 posts).                         |
| Overseers (161 posts).                            | Overseers (83 posts).              | Overseers (18 posts).              |                                    |   | Overseers (102 posts).             | Overseers (83 posts).              | Overseers (12 posts).              |
| Tracers (71 posts).                               |                                    |                                    |                                    |   | Tracers (18 posts).                |                                    |                                    |

NOTE.—The pay-scales of the technical staff are given in a separate accompaniment (Appendix B). The clerical staff for the Land Improvement Officers' office and that for the District Land Improvement Officers' offices are given separately, with their pay scales in a separate accompaniment (Appendix C).

## APPENDIX 'B'.

*Grades and pays of the staff in the Land Improvement Section, North. Circle.*

| Sl. No. | Designation.                                       | No. of posts. | Grade of post.   |  | Starting and additional pay and allowances. |         |        |
|---------|--|---------------|--|--|---|---------|--------|
|         |  |               | Rs.  |  | Pay.  | S. Pay. | P.T.A. |
| 1       | Land Improvement Officer, North                    | 1             | 1100-50-1500   |  | 1,100/-                                     |         |        |
| 2       | Assistant Land Improvement Officer, (Survey).      | 1             | 170-10-250 E.B.—<br>15-400 E.B.-20-500.  |  | 170/-                                       | 60/-    |        |
| 3       | Dry Farming Superintendent                         | 1             | Do.  |  |   |         |        |
| 4       | Assistant Land Improvement Officer, (Forest).      | 1             | 235-15-400-20-500.   |  | 235/-                                       |         |        |
| 5       | District Land Improvement Officers, (Survey).      | 5             | 170-10-250 E.B.—<br>15-400 E.B.-20-500   |  | 170/-                                       | 35/-    |        |
| 6       | District Land Improvement Officers, (Dry Farming). | 2             | Do.  |  | 170/-                                       | 35/-    |        |
| 7       | Senior Land Assistants (Survey) ..                 | 8             | 160-10-250   |  | 160/-                                       | 35/-    | 90/-   |
| 8       | Senior Land Assistants (Dry Farming).              | 4             | Do.  |  | 160/-                                       | 35/-    | 99/-   |
| 9       | Junior Land Assistants (Survey). ..                | 9             | 110-8-150.<br>B.Sc., B.E.,<br>B.Sc. (Ag.) & B.Ag.<br>D.C.E.<br>Non-D.C.E. or non-graduate. |  | 118/-                                       | 30/-    | 75/-   |
| 10      | Field Assistants (Survey) ..                       | 40            | 70-5-100 ..<br>B.Sc., B.E.,<br>B.Sc. (Ag.) & B.Ag.<br>D.C.E. or similar qualifications.    |  | 90/-  | 30/-    | 49/8/- |
| 11      | Field Assistants (Dry Farming) ..                  | 8             | Non-qualified<br>B. Ag.  |  | 70/-  | 15/-    | 49/8/- |
| 12      | Overseers (Survey) ..                              | 88            | 50-5/2-100 (Trained)<br>Untrained  |  | 50/-  | —       | 24/-   |
| 13      | Overseers (Dry Farming) ..                         | 40            | 50-5/2-100 (Trained)<br>Untrained  |  | 35/-  | —       | 21/-   |
| 14      | Field Assistants (Forest) ..                       | 4             | 80-5-125-5-150   |  | 80/-  | —       | 75/-   |
| 15      | Overseers (Forest) ..                              | 12            | 30-1-40-45-50-60   |  | 50/-  | —       | 24/-   |
| 16      | Forest Guards ..                                   | 24            | 15-1/2-20-25   |  | 25/-  | —       | ..     |

## APPENDIX 'C'.

*Clerical staff for the office of the land Improvement officer.*

| Designation.                |    | North. |  | South. |  |
|-----------------------------|----|--------|--|--------|--|
| 1. Personal Assistant       | .. | 1      |  | 1      |  |
| 2. A. Stores Superintendent | .. | 1      |  | 1      |  |
| 3. Head Clerk               | .. | 1      |  | 1      |  |
| 4. Stenographer             | .. | 1      |  | 1      |  |
| 5. Senior Accountant        | .. | 1      |  | 1      |  |
| 6. Junior Accountant        | .. | 1      |  | 1      |  |
| 7. Senior Clerk             | .. | 1      |  | 1      |  |
| 8. Junior Clerks            | .. | 5      |  | 6      |  |
| 9. Draftsman                | .. | 1      |  | 1      |  |
| 10. Tracers (Office)        | .. | 2      |  | 2      |  |
| 11. Store-keeper            | .. | 1      |  | 1      |  |

Clerical staff for the offices of the Assistant Land Improvement Officer and District Land Improvement Officer.

|                     |    | No. |  |
|---------------------|----|-----|--|
| 1. Senior Clerk     | .. | 1   |  |
| 2. Junior Clerk     | .. | 1   |  |
| 3. Tracers (Office) | .. | 5   |  |
| 4. Draftsman        | .. | 1   |  |
| 5. Store-clerk      | .. | 1   |  |

only for Survey Section under each District Land Improvement Officer.

## APPENDIX 'D'.

| Sl. No. | Designation.                    | Grade of post. Rs.                                       |
|---------|---------------------------------|--|
| 1       | Personal Assistant (Accountant) | 200-10-263.  |
| 2       | Head Clerk                      | 90-5/2-115.  |
| 3       | Senior Accountant               | 85-5/2-100 (Old).<br>80-5/2-95 (new).                    |
| 4       | Junior Accountant               | 85 5/2/101- (Old).<br>80-5/2-95 (New).                   |
| 5       | Senior Clerks                   | 85-5/2-100 (Old).<br>80 5/2-95 (new).                    |
| 6       | Junior Clerks                   | 25 5/2-55, with one post of stenographer with allowance. |
| 7       | Draftsman                       | 80-5-130.  |
| 8       | Tracers (Office)                | 50-5/2-100.  |
| 9       | Tracers (Field)                 | 50-5/2-100 plus 24/- P.T.A.                              |
| 10      | Store-keeper                    | 40-4-80.   |
| 11      | Store-clerks                    | 25-5/2-55.   |
| 12      | Naiks                           | 19/-.  |
| 13      | Peons                           | 15/-.  |
| 14      | Khalasis                        | 15/-.  |
| 15      | Store coolies                   | 15/-.  |
| 16      | Store Superintendent            | 150-5-200.   |

## APPENDIX 'E'.

*Note on the Land Improvement Act as applied to Bunding and Dry Farming Schemes.*

The legal position is that defined by the Land Improvement Schemes Act, No. XXVIII of 1942 and subsequent amendments. Its provisions are many, the main are:—

(a) The constitution of a Board consisting of the Revenue Commissioner as Chairman and the Director of Agriculture and the Conservator of Forests of the area as members. The Land Improvement Officer is ex-officio Secretary to the Board. There is a separate board for each Revenue Division.

(b) This Board directs the preparation of the Land Improvement Scheme for any area within its jurisdiction. A Scheme may provide for any or all of the following:—

Soil and moisture conservation, introduction of Dry Farming methods, improved agricultural practices, reclamation of water-logged land or land from the sea, control or prohibition of grazing, control or maintenance of vegetation and tree growth and any matter not inconsistent with the objects of the Act.

(c) The Board appoints an officer to prepare a Draft Scheme which must state the objects of the scheme, the area proposed to be covered by the scheme, the nature of work to be carried out, the agency through which execution is to be effected and any other particulars as may be prescribed.

(d) The officer so appointed, prepares and submits the scheme to the Board which may accept it with or without modification or even reject it. If the Board accepts the scheme it is published in the official gazette, in the village or villages covered by the scheme, at the taluka or Mahal and District headquarters in which the areas lie. An enquiry officer is immediately appointed by the Board to hear and record all objections to the scheme or part thereof. Those objections may be

oral or written and must be made within 21 days from the date of publication of the scheme in the official gazette. The enquiry officer is granted summary powers under the Land Revenue Code of 1879 and has power to summon and enforce the attendance of witnesses who can be examined on oath and who can be compelled to produce any documents essential to the enquiry.

The enquiry officer submits his enquiry report, with such modification as he may deem necessary, to the Board which, provided the objections are less than 33 per cent of the owner or owners owing 33 per cent of the land, other than the Crown lands, sanctions the scheme with or without modification or rejects it. If the objections exceed the prescribed limit the Board must submit the scheme to the Provincial Government for orders. Government accept the scheme with or without modification or reject it. If there is acceptance of a scheme either by the Board or Government it must be published in the official gazette, in the village or villages concerned and the taluka or Mahal and district headquarters in which the lands lie. Publication of a scheme causes it to become final, legal and in force from the date of publication. The Board also has powers to make regulations in respect of any matters supplementary or incidental to the scheme.

After the scheme has come into force the Board will appoint an officer to execute it and it will specify the period within which the cost of executing the scheme will be recovered from the respective owners. Any person wishing to execute the work in his own lands shall be permitted to do so provided he gives notice, in writing, to this effect to the executive officer within 21 days of the publication of the sanctioned scheme in the official gazette and undertakes to complete the work within the period stipulated by the executive officer to carry it out by Government agency at the cost of the owner.

On the completion of a scheme, the executive officer prepares a statement, with a map, detailing the work done with cost thereof, the total amount to be recovered from the owners, the general rate, per annum or per rupee of recovery, the period of recovery, the person or class of persons responsible for maintenance of the work in repair and a list of survey Nos. or sub-divisions from the owners of which a rate other than the usual rate is to be recovered for specific reasons, to be recorded.

The statement with the map is sent to the Mamlatdar or Mahalkari for incorporation in the Record of Rights. Every person shown as liable in the Record of Rights must maintain and repair the works carried out to the satisfaction of the Land Improvement Officer. If a person fails to do so within the time prescribed by the Land Improvement Officer, this officer shall repair the work at the cost, plus a surcharge of 25 per cent of the cost of repair, of the land owner.

The Provincial Government may themselves direct the preparation of any scheme in any area in which famine or scarcity prevails or is likely to prevail, or in any case in which the Provincial Government or Trust may contribute not less than 25 per cent of the cost of the scheme, or in any area in which Land Improvement is necessary in the interest of any member or members of H. M. Forces, whether in service or retired, or of their dependents. The Government appoints an officer to prepare the draft scheme which is submitted to Government through the Board. Thereafter the procedure is the same as that prescribed for schemes ordered by the Board.

All schemes executed to date or in the process of execution have been directed by Government and are carried out by Government agency.

A penalty clause has been added to the Act. It lays down that if any person contravenes any provisions of the sanctioned scheme or any of the regulations made by

the Board or fails to fulfil any liability imposed upon him he shall on conviction be liable to a fine up to Rs. 50/- or with simple imprisonment for a period up to one month or both.

The sanctioned cost per acre for the Bunding and Dry Farming schemes, at present, is Rs. 12/- plus Rs. 3/- per acre, for Dry Farming. A land-owner has to repay Rs. 9/- per acre, towards the cost of the bunding. For the first two years, after the land is bunded, he repays nothing and thereafter he repays annas twelve (-/12/-) per acre per year, for 12 years. There are no interest charges, but the land-owner must, from the second year after the lands are bunded, maintain the bunds in proper repair. Government undertakes to maintain the bunds under proper repair for the first year after the lands are bunded.

## APPENDIX 'F'.

### *Prospectus for the training courses of Dry Farming Assistants and Dry Farming Kamgars at Sholapur.*

(a) *Aims and Objects.*—To train candidates in the Dry Farming Methods of cultivation etc., with a view to fit them for the post of Dry Farming Assistants and Dry Farming Kamgars in the temporary Land Improvement Section of the Agricultural Department.

(b) *Qualifications (minimum) required for admission.*—Under-graduates (probably Inter-Science) in the case of Dry Farming Assistants and Matriculation in the case of Dry Farming Kamgars.

(c) *Age Limit.*—25 years for advanced classes and 28 years for intermediate and backward classes.

(d) *Duration of Course.*—One year (commencing from 2nd January each year) in the case of Dry Farming Assistants and 6 months (commencing from 2nd January and 1st July each year) in the case of Dry Farming Kamgars.

(e) *Fees.*—The training is given free of cost.

(f) *Stipend.*—The students admitted are given stipend at the rate of Rs. 40/- p.m. each in the case of Dry Farming Assistants and Rs. 30/- p.m. each in the case of Dry Farming Kamgars plus dearness allowance.

(g) *Lodging and Boarding.*—Free lodging is provided at the site of the training. The students will have to make their own arrangement for messing 'round the amount of stipend paid to them.

(h) *Agreement of Service.*—The students are required to execute an agreement of service on Rs. 1½ bond for serving Government for a period of at least 3 years, if Government require to do so, after completion of training.

(i) *Physical fitness.*—The candidate must pass physical fitness examination by Civil Surgeon for admission to the Training Centre.

(j) *Scales of Pay.*—After satisfactory completion of the training and on appointment in the Department, the student will be paid an initial salary of Rs. 70/- p.m. in the grade of Rs. 70-5-100 in the case of Dry Farming Assistants and Rs. 50/- p.m. in the grade of Rs. 50-3-100 in the case of Dry Farming Kamgars. (k) *To whom application should be made for admission and further particulars.*—The Soil Physicist to Government, B. P., Sholapur.

**Syllabus for the training courses of Dry Farming Assistant and Dry Farming Kamgars at Sholapur.**

**I.—GENERAL AGRICULTURE.**

- (i) *Soils.*
- (ii) *Fertilizers & Manures.*
- (iii) *Tillage & Tillage implements.*
- (iv) *Plants.*
  - (a) General.
  - (b) Special characteristics of the common agricultural plants (crops).
- (v) *Livestock.*
- (vi) *Pests and Diseases.*
- (vii) *Levelling & Surveying.*
- (Land Improvement Section).

**II.—FARM MANAGEMENT.**

- (i) *Cropping Schemes.*
- (ii) *Observations on Crops and Meteorology.*
- (iii) *Management of Labour.*
- (iv) *Management of Farm animals.*
- (v) *Management of Stores.*
- (vi) *Management of implements.*
- (vii) *Management of Farm Buildings including fence, gate, &c.*
- (viii) *Management of Water on the farm & farm sanitation.*
- (ix) *Book-Keeping.*
- (x) *Experimental data & Statistical methods.*
- (xi) *Propaganda.*
- (xii) *Economics of Crop production.*

**III.—DRY FARMING.**

- (i) *Dry farming definition and historical.*
- (ii) *Meteorological features.*
- (iii) *Soils of the dry farming regions.*
- (iv) *Disposal of rain-water.*
- (v) *Soil erosion & its control measures.*
- (vi) *Soil Moisture relationships.*
- (vii) *Soil and Plant relationships.*
- (viii) *Dry farming implements.*
- (ix) *Study of the dry farming crops & their special cultural methods.*
- (x) *Contour cultivation & strip cropping.*
- (xi) *Economics of dry farming methods.*